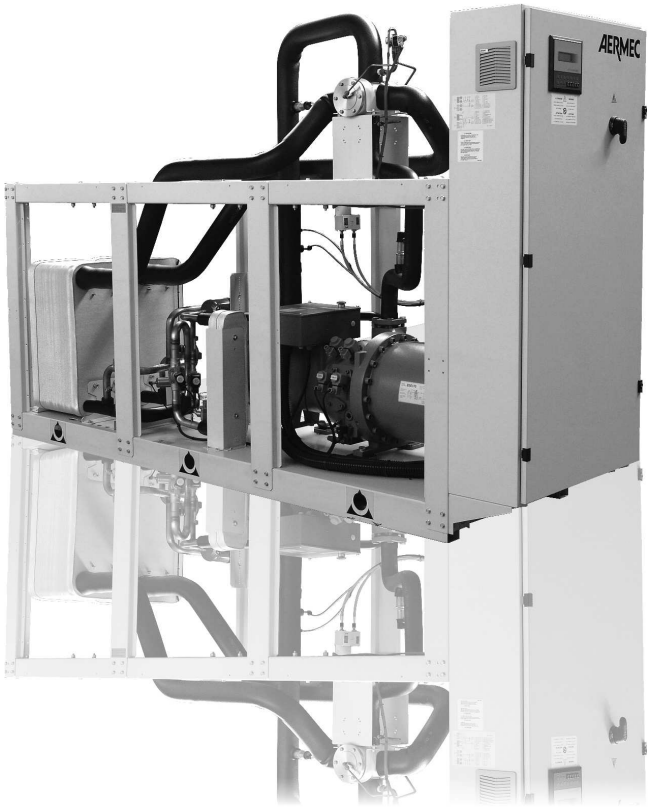
English

WSH

R134a

TECHNICAL MANUAL - INSTALLATION - MAINTENANCE

Water to water chiller, with screw compressors



166 kW÷ 672 kW

183 kW ÷ 784 kW

IWSHPY. 0809. 4471121_00

Dear Customer,
Thank you for choosing an AERMEC product. It is the result of long experience and design-specific research.The article has been made of materials of the highest quality and incorporates cutting edge technology.
In addition, all our products bear the EC mark indicating that they meet the requirements of the European Machine Directive regarding safety. The standard of quality is permanently being monitored and AERMEC products are therefore a synonym of Safety, Quality and Reliability.

The data might undergo modifications considered necessary for the improvement of the product at any time, without the obligation for any notice thereof.

Thank you again.
AERMEC S.p.A

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To install the unit, please observe the safety warnings included in these instructions

Danger: moving parts

Danger: cut off power supply

Danger: high temperature

General danger

Danger: power supply

Useful information and warnings

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WSH

SERIAL NUMBER	

DECLARATION OF CONFORMITY We, the undersigned, declare on our own exclusive responsibility that the object in question, so defined:

NAME **WSH**

TYPE **CHILLER, HEAT PUMP WATER TO WATER**

Model

To which this declaration refers, complies with the following standardised regulations:

CEI EN 60335-2-40	Safety regulation regarding electric heat pumps, air conditioners and dehumidifiers
CEI EN 61000-6-1 **CEI EN 61000-6-3**	Electromagnetic immunity and emission in residential environment
CEI EN 61000-6-2 **CEI EN 61000-6-4**	Electromagnetic immunity and emission in industrial environment
EN378	Refrigerating system and heat pumps - Safety and environmental requirements
UNI EN 12735	Round weldless copper pipes for air conditioning and cooling
UNI EN 14276	Pressure equipment for refrigerating systems and heat pumps

Thus meeting the essential requisites of the following directives:

- LV Directive: 2006/95/EC
- Electromagnetic Compatibility Directive 2004/108/EC
- Machine Directive 98/37/EC
- PED Directive relating to pressure equipment 97/23/EC

In compliance with Directive 97/23/EC, the product meets the Full quality assurance procedure (module H) with certificate no. 06/270-QT3664 Rev.3 issued by the notified body no. 1131 CEC via Pisacane 46 Legnano (MI) - Italy

Bevilacqua 14/12/2007

Marketing Director
Signature

1. WARNINGS ON THE DOCUMENTATION

1.1. INTENDED USE

WSH AERMEC chillers have been built according to the technical standards and the recognised safety regulations. These units have been designed and manufactured for cooling and must be used accordingly, and taking into account their performance characteristics. There may still arise risks for the safety of the user or third parties, or even damage to the units and other objects, in case of improper use.
Any use not specifically indicated in this manual is forbidden. Therefore, **AERMEC shall not be held responsible for any damage whatsoever resulting from the non-compliance with these instructions**

1.2. CONSERVATION OF THE DOCUMENTS

Deliver the following installation instructions with all the complementary documentation to the user of the unit, who shall be responsible for keeping the instructions so that they are always available when needed.
READ CAREFULLY THIS CHAPTER, the unit must be installed by qualified skilled personnel, in compliance with the national legislation in force in the country of destination. The unit must be installed in such a way as to make all maintenance and/or repair operations possible. The warranty of the device does not in any case cover costs incurred as a result of motorised ladders, scaffolding or any other lifting systems made necessary to carry out the operations under warranty.

The warranty shall not be valid if the indications mentioned above are not observed.

2. ESSENTIAL SAFETY RULES

Remember that the use of products that use electric power and water carries the compliance with some essential safety rules such as:

- The use of this unit is not intended for people (including children) with any physical or mental disability or any sensory impairment nor for people lacking experience and knowledge, unless they are supervised or instructed on the use of the unit by a person responsible for their safety. Children should be supervised in order to make sure that they do not play with the unit.
- It is forbidden to carry out any technical or maintenance operation before disconnecting the unit from the mains by positioning the system and control panel main switches on “off”.
- It is forbidden to modify safety or regulation devices without the manufacturer's authorisation and indications
- It is forbidden to pull, disconnect or twist the outcropping electrical cables of the unit even if it has been disconnected from the mains
- It is forbidden to leave containers and flammable substances near the chiller.
- It is forbidden to touch the unit with wet parts of the body and bare feet.
- It is forbidden to open the access doors to the unit internal parts, without having first turned off the system main switch.
- It is forbidden to spread, leave or keep the packaging material within the reach of children as it may be a possible source of danger.

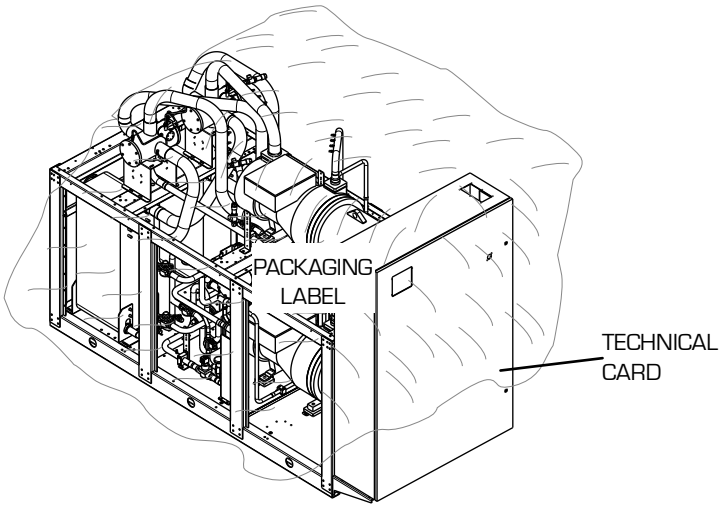
3. PRODUCT IDENTIFICATION

WSH can be identified by:

- **Packaging label**
  that includes the product identification data

- **Technical card**
  Placed on the electronic box side sill.

NOTE
If the identification plate, or any other means to identify the product, is tampered with, removed or missing, installation and maintenance operations are hampered



4. UNIT DESCRIPTION

The units from the **WSH** series are water chillers water condensed for residential and industrial use. The machine is designed for the management of both hydraulic circuits: (evaporator and condenser); therefore, it can be used not only as a water chiller but also to produce hot water.
The commutation between "COOL - HEAT" is obtained by managing the cooling circuit.

The new **WSH** series is characterised by the use of refrigerant **R134a**, which allows reaching performances significantly superior to equivalent products that operate with R407C.
This is also the result of a thorough study and dimensioning of all the internal components in order to make the most of the refrigerant gas characteristics.

The whole series includes models with one or two twin-screw compressors and are fitted with star - delta start to reduce the starting current.
All the units are tested and delivered complete with refrigerant load and oil, (it will be necessary only to make hydraulic and electrical connections on site).
All units have a protection class of IP20 .

4.1. VERSIONS AVAILABLE - "HEAT PUMP (H)"

CAUTION
Before each start-up operation of the unit (or at the end of each extended pause period) it is extremely important to preheat the oil in the compressor casing, by means of the suitable electric heaters, during at least 8 hours. The casing heating element is automatically powered when the unit pauses so that the unit is kept powered up.

4.2. AVAILABLE VERSIONS

With the aid of the configurator, it is possible to set up and then order the chiller that best suits the needs of users or whoever stands in for them.

4.3. CONFIGURATOR

1,2,3	4,5,6,7	8	9	10	11	12	13
WSH	2502	X	°	D	°	°	°

Field	Code	
1, 2 ,3	WSH	
4, 5, 6, 7	Size	0701 - 0801 - 0901 - 1101 - 1402 - 1602 - 1802 - 2002 - 2202 - 2502
8	Field of use	
	°	Standard with processed water above +4"C
	X	With electronic thermostatic valve that permits: - Chiller water up to - 6°C - Control of the cooling capacity with continual modulation (25 - 100%)
9	Model	
	°	Standard
10	Heat recovery units	
	°	Without recovery units
	D	Desuperheater
11	Version	
	°	Standard
	L	Quiet operation
12	Heat exchangers	
	°	Standard according to PED
14	Power supply	
	°	3~ 400V - 50 Hz with fuses
	2	3~ 230V - 50 Hz with fuses
	4	3~ 230V - 50 Hz with thermomagnetic switches
	5	3~ 500V - 50 Hz with fuses
	8	3~ 400V - 50 Hz with thermomagnetic switches
	9	3~ 500V - 50 Hz with thermomagnetic switches

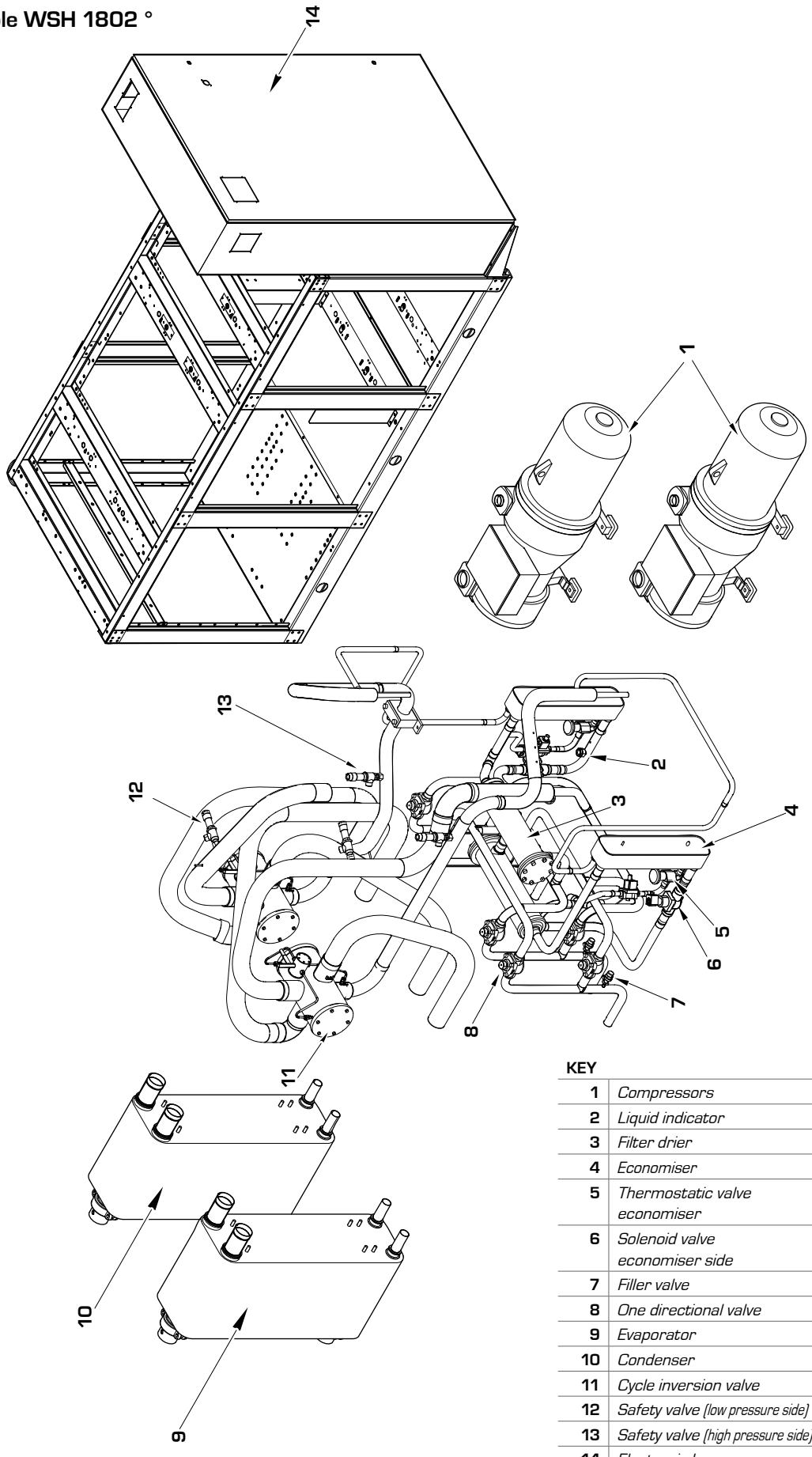
(1) ELECTRONIC VALVE

"ELECTRONIC EXPANSION VALVES" are characterised by a high regulation capacity that allows compressors to always work in the best possible operating conditions (compatible with the outdoor ambient conditions).
In winter it is therefore possible to work with very low condensation pressure, improving the efficiency of compressors and reducing power consumption.

With the electronic valve in our chillers, temperature adjustment is more efficient, as it is possible to obtain lower working temperatures making the best use of the evaporator surface. Besides, the system does not require future settings or adjustments, since the electronic valve operates continuously its control function according to the parameters obtained from the transducers, keeping optimum overheating values. Apart from better pressure conditions, there are better temperature conditions for the compressors, keeping discharge temperatures lower than the ones obtained when using the standard thermostatic valve. This results in a longer service life for the compressor and a reduction in the number of failures.
To summarise, the advantages of using the electronic valve are:
- Energy saving in the system consumption levels
- Better working conditions for compressors (lower pressure and lower discharge temperature), which results in less failures and a reduction in the maintenance costs.
- Continuity of performance throughout time
- Less deterioration of the compressor mechanical parts and of the lubricating oil
- Repeatability of the adjustment and energy consumption results throughout time.

All this in acknowledgement of AERMEC commitment to and respect for the problems related to energy saving and conscious and socially responsible use of the available resources.

Example WSH 1802 °



KEY	
1	*Compressors*
2	*Liquid indicator*
3	*Filter drier*
4	*Economiser*
5	*Thermostatic valve economiser*
6	*Solenoid valve economiser side*
7	*Filler valve*
8	*One directional valve*
9	*Evaporator*
10	*Condenser*
11	*Cycle inversion valve*
12	*Safety valve (low pressure side)*
13	*Safety valve (high pressure side)*
14	*Electronic box*

5.1. REFRIGERATING CIRCUIT

Compressors
Semi hermetic high-efficiency bi-screw compressors, with a cooling capacity regulation by means of continuous modulation from 40 to 100% (from 25 to 100% with electronic valve) and fitted with:
- Thermal motor protection
- Oil discharge temperature check
- Electric heater for the heating of the oil casing with the compressor at a standstill
- Reset button.

Exchanger (condenser)
Of the plate type (AISI 316), it is insulated externally with closed cell material to reduce thermal dispersions.

Exchanger (evaporator)
Of the plate type (AISI 316), it is insulated externally with closed cell material to reduce thermal dispersions.

Economiser
Plate type (AISI 316). This allows the additional cooling of the refrigerant exiting the condenser and at the same time creates a vapour to be injected in an intermediate point of the condensing process; reducing both the delivery temperature as well as the electrical absorption.

Filter drier
Of the mechanical type made of ceramics and hygroscopic material able to trap impurities and any traces of humidity in the cooling circuit.

Liquid indicator
For checking that the refrigerant gas load and any humidity in the cooling circuit.

Thermostatic valve
The mechanical type valve with outside equaliser on the evaporator outlet modulates the gas flow to the evaporator dependent on the thermal load in such a way as to ensure the proper intake gas degree of overheating.

Thermostatic valve (economiser)
The mechanical type valve with outside equaliser on the economiser outlet, on the inlet of the compressor to improve performance.

Solenoid valve
The valve closes when the compressor turns off, preventing the flow of refrigerant gas towards the evaporator.

One way valve
This allows the refrigerant to flow in just one direction.

Mechanical filter
Positioned in the liquid injection line to the compressor, it retains the impurities that may be present in the refrigerant circuit.

5.2. FRAME

Load-bearing structure
Made of hot galvanised steel sheet of adequate thickness, it is painted with polyester powders able to resist the atmospheric agents over time. Colour RAL 9002.

Acoustic protection cover (silenced versions)
IT is made of hot galvanised steel sheet of adequate thickness, with internal acoustic insulation, and externally painted with polyester powders able to resist the atmospheric agents over time. Colour RAL 9002.

5.3. SAFETY AND CONTROL COMPONENTS

High pressure switch (manual + automatic)
Factory-calibrated, it is placed on the high pressure side of the cooling circuit, it shuts down compressor operation in the case of abnormal operating pressure.

Low pressure transducer
It makes it possible to show the value of the compressor's intake pressure (one per circuit) on the microprocessor card display. Placed on the low pressure side of the cooling circuit, it shuts down compressor operation in the case of abnormal operating pressure.

High pressure transducer
It makes it possible to show the value of the compressor's delivery pressure (one per circuit) on the microprocessor card display. Placed on the high pressure side of the cooling circuit, it shuts down compressor operation in the case of abnormal operating pressure.

Cooling circuit safety valves (HP - LP)
Calibrated to 22 bar HP and 16.5 LP, they cut in relieving the overpressure in the case of abnormal operating pressures.

5.4. ELECTRICAL COMPONENTS

Electrical panel
Contains the power section and the management of the controls and safety devices. This conforms with standard CEI 60204-1, and electromagnetic compatibility directives EMC 89/336/CEE and 92/31/CEE.

CPCE valve
Hot gas injection device up stream of the evaporator, fitted on the partial or total heat recovery versions.

NOTE
Furthermore, all the cables are wired for immediate recognition of all the electrical components.

Door lock knife switch
THE electrical panel can only be accessed by cutting off power using the opening lever on the panel itself. This lever can be locked in place using one or more padlocks, during maintenance in order to prevent the machine being powered up accidentally.

Control keypad
Provides full control functions. For a detailed description of the keypad refer to the user manual.
- **secondary thermomagnetic switch protection**

5.5. ELECTRONIC REGULATION

Electronic regulation on the "WSH" chillers consists of control cards (pCO^2) for each compressor connected to each other in a network and a control panel with display. In the case of models with more compressors, the card that controls compressor 1 is the "MASTER" card, while the others are "SLAVE". On each card, the transducers, loads and alarms corresponding to the compressor that commands are connected, while the general machine ones are connected only on the "MASTER card.

Microprocessor
- Remote on/off with external contact without power
- Multilingual menu
- Phase sequence control
- Independent control of individual compressors
- Ammeter transformer
- Cumulative failure block signalling

- Alarm log function
- Daily/weekly programming
- Inlet/outlet water temperature display
- Alarm display
- Full proportional regulation of the output water temperature
- Programmable timer function
- Function with double setting point connected to an external contact
- Interfaceability with the Modbus protocol (accessory)
- Pump control
- Compressor rotation control
- Analogue input from 4 to 20 mA
- Outside air temperature sensor
- "Always Working" function. In the case of critical conditions (e.g. an ambient temperature that is too high) the machine does not stop but is able to regulate itself and provide the maximum power that can be generated in those conditions.
- Self adapting operating differential "Switching Histeresys" to ensure the correct compressor functioning at all times even in plants with a low water content or insufficient flow rates. This system reduces the compressor wear
- The PDC "Pull Down Control" system to prevent the activation of the power steps when the water temperature is approaching the set point quickly. It optimises the operation of the machine both when running normally or when there are load variations, thereby assuring top machine efficiency in all situations

6. ACCESSORIES

		0701	0801	0901	1101	1402	1602	1802	2002	2202	2502
AER485P2		Through this accessory it is possible to connect the unit with BMS supervision systems with electrical standard RS 485 and MODBUS type protocol.									
		•	•	•	•	•	•	•	•	•	•
AVX		Sprung vibration damping supports.									
	°	665	665	665	666	662	662	662	663	664	664
	D	665	665	665	666	662	662	662	663	664	664
PRV		This allows the refrigerator command operations to be given from a distance.									
		•	•	•	•	•	•	•	•	•	•
ROMEO		The ROMEO device makes it possible to remotely control the chiller from an ordinary cell phone with WAP browser, it also makes it possible to send alarm and pre-alarm SMS to up to three GSM cell phones even if they are not fitted with the WAP browser. The set includes the AER485. The accessory AER485P2 must be added to this kit.									
		•	•	•	•	•	•	•	•	•	•
RIF (on the 400V - 3 - 50 HZ VERSIONS ONLY)	(1)	Parallel connection with the motor makes the reduction of input current possible.									
		161	161	201	241	161 x 2	161 x 2	201 x 2	201 + 241	241 x 2	301 x 2
MULTICHILLER		Control system to command, turn on and off the individual chillers in a system in which several units are installed in parallel. It is possible to select it among different command logics: sequential, homogenous, combined. The accessory is delivered in IP65 box.									
		•	•	•	•	•	•	•	•	•	•
AKW: ACOUSTIC KIT		This accessory allows additional reduction of the noise by means of: - Hood of the machine optimised by high density lead free materials which allow further reduction of vibrations.									
		L	L	L	L	L	L	L	L	L	L

(1) *Accessory that can only be installed in the factory*

7. TECHNICAL DATA

WSH

COOLING ONLY				0701	0801	0901	1101	1402	1602	1802	2002	2202	2502
Cooling capacity:			kW	166	196	217	270	360	428	466	526	594	672
Total input power			kW	36	41	47	57	76	88	99	109	120	138
Evaporator water flow rate			l/h	28550	33710	37320	46440	61920	73620	80150	90470	102170	115580
Evaporator pressure drop			kPa	23	24	22	27	43	47	48	59	65	74
Condenser water flow rate			l/h	34740	40760	45410	56240	74990	88750	97180	109220	122810	139320
Condenser pressure drop			kPa	30	31	30	36	57	62	65	79	88	101

HEATING													
Heating capacity			kW	183	210	237	300	420	490	540	620	700	784
Total input power			kW	44	50	57	72	98	116	125	144	162	176
Condenser water flow rate			l/h	31480	36120	40760	51600	72240	84280	92880	106640	120400	134850
Condenser pressure drop			kPa	24	23	23	29	57	62	63	72	79	90
Evaporator water flow rate			l/h	23910	27520	30960	39220	55380	64330	71380	81870	92540	104580
Evaporator pressure drop			kPa	15	15	14	18	27	29	29	32	36	40

ENERGY INDICES													
EER			W/W	4,61	4,78	4,62	4,74	4,74	4,86	4,71	4,83	4,95	4,87
EEC				C	B	C	B	B	B	B	B	B	B
COP				4,16	4,20	4,16	4,17	4,29	4,22	4,32	4,31	4,32	4,45
EEC				B	B	B	B	B	B	B	B	B	A

ELECTRICAL DATA													
Power supply			V	400V-3-50Hz									
Total input power	cool		A	65	73	80,6	100	135	146,5	162	187,5	210	242
	hot		A	81	91	101	130,5	178,5	210	221	256,5	291	320
Maximum current	FLA		A	124	144	162	182	248	288	324	344	364	430
Peak current	LRA		A	163	192	229	300	287	336	391	462	482	575

Compressors													
Type				twin-screw	twin-screw	twin-screw	twin-screw	twin-screw	twin-screw	twin-screw	twin-screw	twin-screw	twin-screw
Number			n°	1	1	1	1	2	2	2	1+1	2	2
Number per circuit			n°/n°	1/1	1/1	1/1	1/1	2/2	2/2	2/2	2/2	2/2	2/2

CAPACITY CONTROL													
Capacity control	VT	°	%	40-100	40-100	40-100	40-100	20-100	20-100	20-100	20-100	20-100	20-100
	VT	x	%	25-100	25-100	25-100	25-100	12.5-100	12.5-100	12.5-100	12.5-100	12.5-100	12.5-100

EVAPORATOR													
Type				Plates									
Number			n°	1	1	1	1	1	1	1	1	1	1
Hydraulic connections			Type/ø	V/3"	V/3"	V/3"	V/3"	V/3"	V/3"	V/3"	V/3"	V/3"	V/3"

CONDENSER													
Type				Plates									
Number			n°	1	1	1	1	1	1	1	1	1	1
Hydraulic connections				V/3"	V/3"	V/3"	V/3"	V/3"	V/3"	V/3"	V/3"	V/3"	V/3"

SOUND DATA													
Sound power			dB(A)	86.0	86.0	86.0	92.0	89.0	89.0	89.0	93.0	95.0	95.0
Sound pressure			dB(A)	54.0	54.0	54.0	60.0	57.0	57.0	57.0	61.0	63.0	63.0

DIMENSIONS - outdoor installation													
Height	(°)		mm	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050
Height	L		mm	2120	2120	2120	2120	2120	2120	2120	2120	2120	2120
Width			mm	809	809	809	809	1249	1249	1249	1249	1249	1249
Length			mm	2960	2960	2960	3360	3060	3060	3060	3460	3460	3460
Weight	(°)		kg	1391	1443	1506	1946	2276	2350	2423	2872	3309	3407
Weight	L		kg	1622	1674	1737	2206	2542	2616	2689	3168	3605	3703

DATA STATED ACCORDING TO EN14511:2004

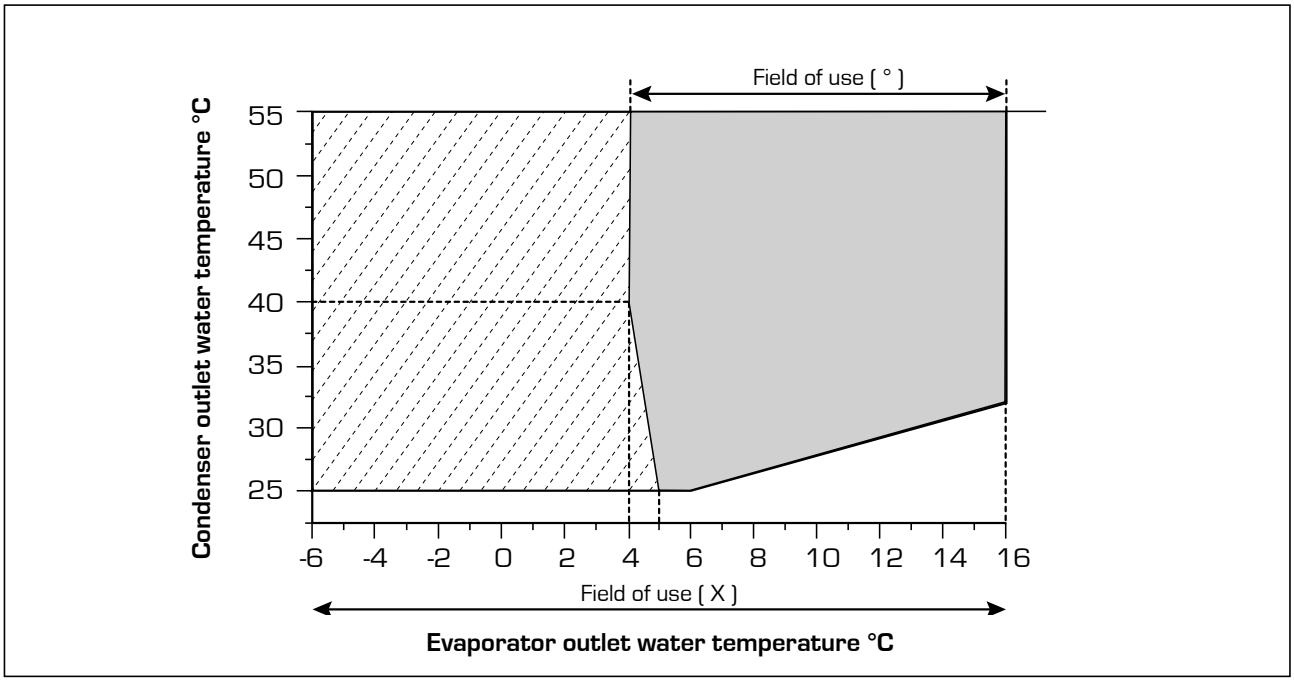
Automatic

- *Processed water temperature 7 °C*
- *Condenser inlet water temperature 30 °C*
- *Δt 5k*

Heating

- *Processed water temperature 45 °C*
- *Evaporator inlet water temperature 10 °C*
- *Δt 5k*
- *Sound pressure measured 10 m. away in the open, with direction factor Q=2 according to ISO 3744*
- *Sound power The Aermec sound power value is determined on the basis of measurements taken in accordance with the ISO 9614-2 standard, in compliance with what is required by the EUROVENT Certification*

8. OPERATIONAL LIMITS



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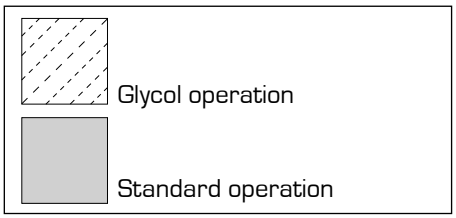


8.1. DESIGN DATE DIR 97/23/CE

		HIGH PRESSURE SIDE	LOW PRESSURE SIDE
Maximum pressure allowable	**bar**	22	16.5
Maximum setting allowable	**°C**	120	55
Minimum temperature allowable	**°C**	-10	-10

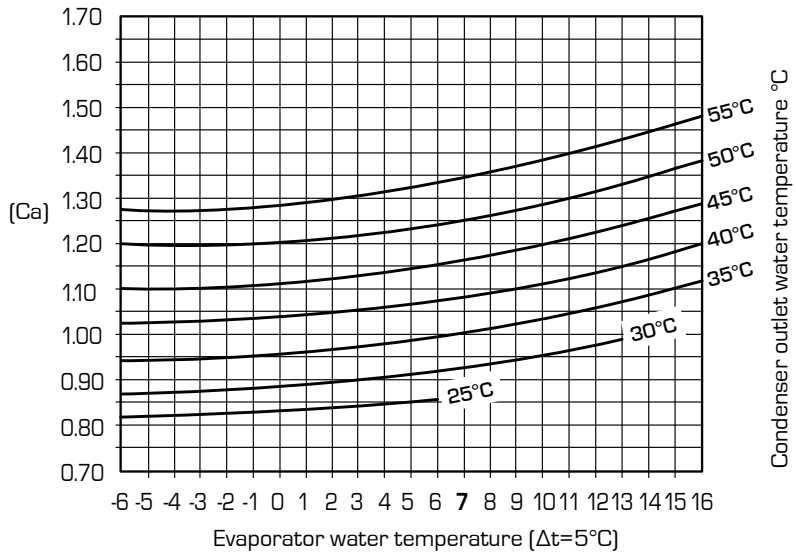
9. CORRECTIVE FACTOR

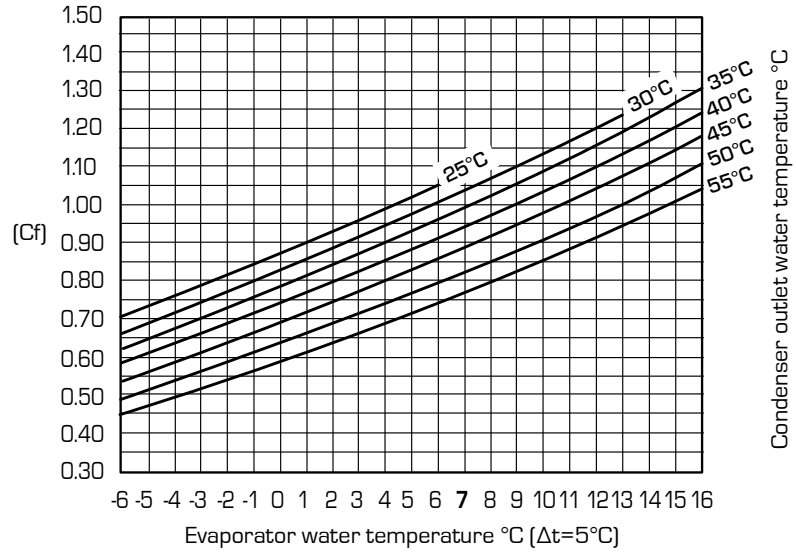
9.1. COOLING CAPACITY AND INPUT POWER

- "STANDARD VERSIONS"

- "HEAT PUMP IN COOLING OPERATION VERSIONS"

The cooling capacity yielded and the input electrical power in conditions other than rated conditions are obtained by multiplying the rated values (Pf, Pa) by the respective correction coefficients (Cft, Cpa).
The following diagrams are used to obtain the correction coefficients to be used for the units, in the different versions, in cooling operation; next each curve the external air temperature to which it refers is shown.





KEY:
Cf = Cooling capacity correction coefficient

Ca = Input power correction coefficient

NOTE:
FOR THE X VERSIONS with temperatures below 4 °C contact the company

FOR ΔT DIFFERENT FROM 5°C
to the evaporator refer to Tab.9.3.1 for cooling capacity and input power correction factors. To account for exchanger soiling, apply the relative fouling factors (tav. 9.4.1)

9.2. HEATING CAPACITY AND INPUT POWER

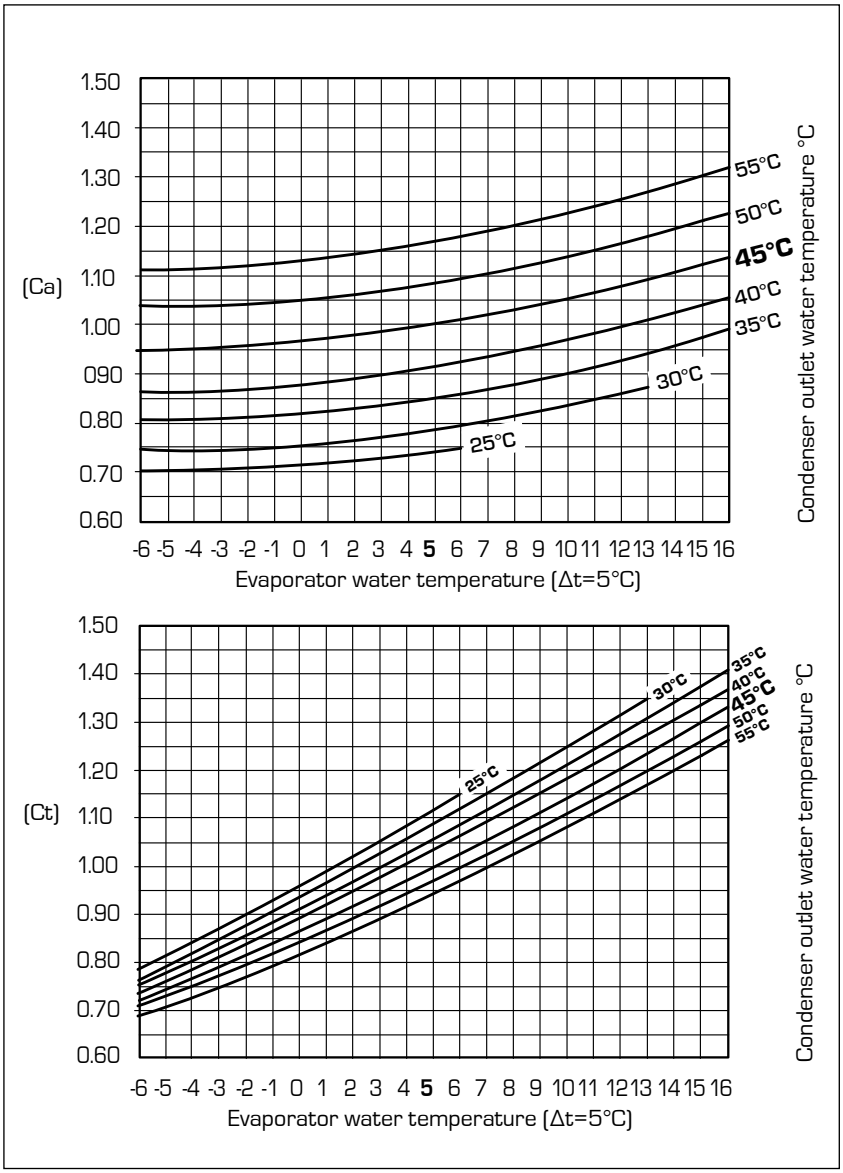
- "HEAT PUMP VERSIONS"

The heating capacity yielded and the input electrical power in conditions other than rated conditions are obtained by multiplying the rated values (Pf, Pa) by the respective correction coefficients (Cft, Cpa).
The following diagram makes it possible to obtain the corrective coefficients; corresponding to each curve, the temperature of the hot processed water referred to is reported, assuming a difference in water temperature between the input and output of the condenser equal to 5°C.

The yields are intended as net of the defrosting cycles.

KEY:
Ct = Heating capacity correction coefficient

Ca = Input power correction coefficient



9.3. FOR ΔT DIFFERENT FROM THE RATED VALUE

For Δt different from 5°C to the evaporator refer to Tab.9.3.1 for cooling capacity and input power correction factors. To account for exchanger soiling, apply the relative fouling factors (tab. 9.4.1)

9.3.1 Correction factors for Δt different from the Chiller Rated value

	3	5	8	10
Cooling capacity correction factors	0.99	1	1.02	1.03
Input power correction factors	0.99	1	1.01	1.02

9.4. FOULING FACTORS

The performances supplied by the table refer to the conditions of clean pipes with fouling factor = 1. For values different from the fouling factor, multiply the values in the performance table by the coefficients reported.

9.4.1 Fouling factors

	[K*m^2]/[W]	0.00005	0.0001	0.0002
Cooling capacity correction factors		1	0.98	0.94
Input power correction factors		1	0.98	0.95

10. ETHYLENE GLYCOL SOLUTION

- The cooling capacity and input power correction factors take into account the presence of glycol and the different evaporation temperature.

- The pressure drop correction factor already takes into account the different flow rate deriving from the application of the water flow rate correction factor.

- The water flow rate correction factor is calculated in such a way as to keep the same Δt that there would be without glycol.

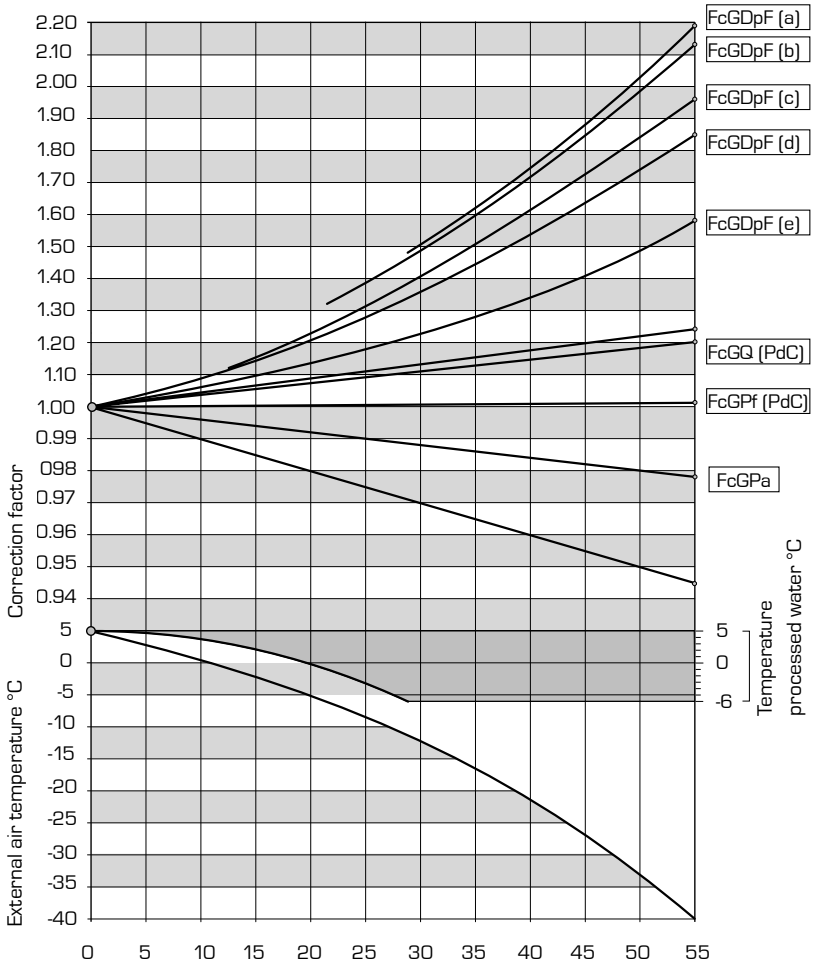
NOTE
To make it easier to read the graph, an example is given on the next page.

By using the diagram below it possible to establish the percentage of glycol necessary; this percentage can be calculated taking into account one of the following factors:
On the basis of the fluid considered (water or air), it will be necessary to enter the graph from the right or left side, from the intersection of the outside air temperature or processed water temperature straight lines and the relative curves, a point is obtained through which the vertical line that will identify both the percentage of glycol and the relative corrective coefficients will have to pass.

10.1. HOW TO READ GLYCOL CURVES

The curves shown in the figure sum up a considerable quantity of data, all of which is represented by a specific curve. To be able to use these curves in the proper way, it is necessary to make some initial considerations:

- If you wish to calculate the percentage of glycol on the basis of the outside air temperature, it is necessary to enter from the left-hand axis and once the curve is intersected, draw a vertical line which will intercept all the other curves in its turn; the points obtained from the upper curves, represent the coefficients for the correction of the cooling capacity and input power , for the flow rates and the pressure drops (remember that these coefficients must anyway be multiplied by the nominal value of the sizes examined); while the lower axis advises the percentage of glycol necessary on the basis of the outside air temperature considered.
- If you wish to calculate the percentage of glycol on the basis of the processed water temperature, it is necessary to enter from the



KEY:

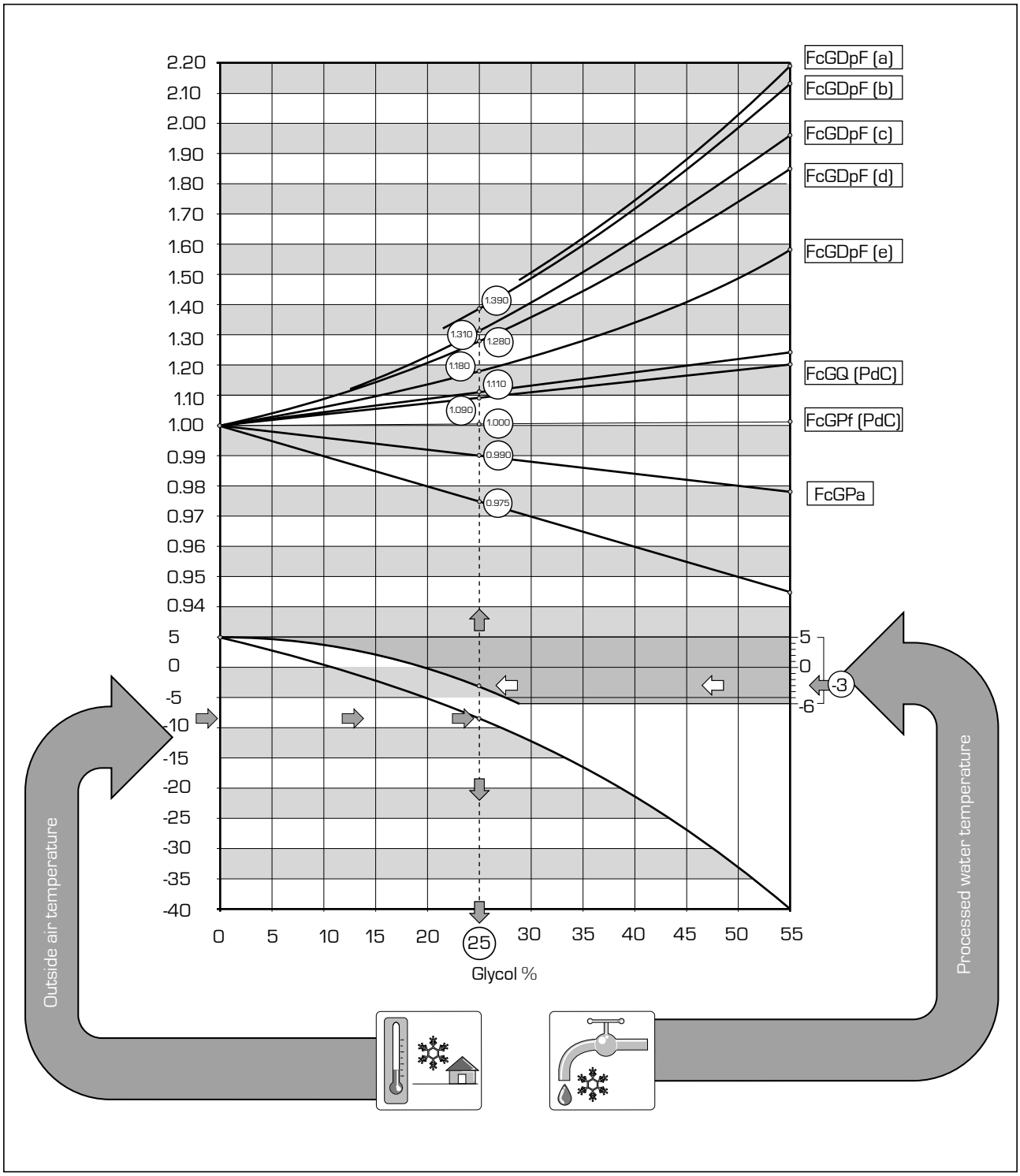
FcGPa	Input power correction factor
FcGDpF (e)	Pressure drop correction factor (average temperature = 47.5 °C)
FcGQF	Capacity correction factor (evap.) (average temperature = 9,5 °C)
FcGQC	Flow rate correction factor (condenser) (average temperature = 47.5 °C)

NOTE

Although it reaches outside air temperatures to -40 °C, it is necessary for the graph to maintain the machine's operating limits as reference.

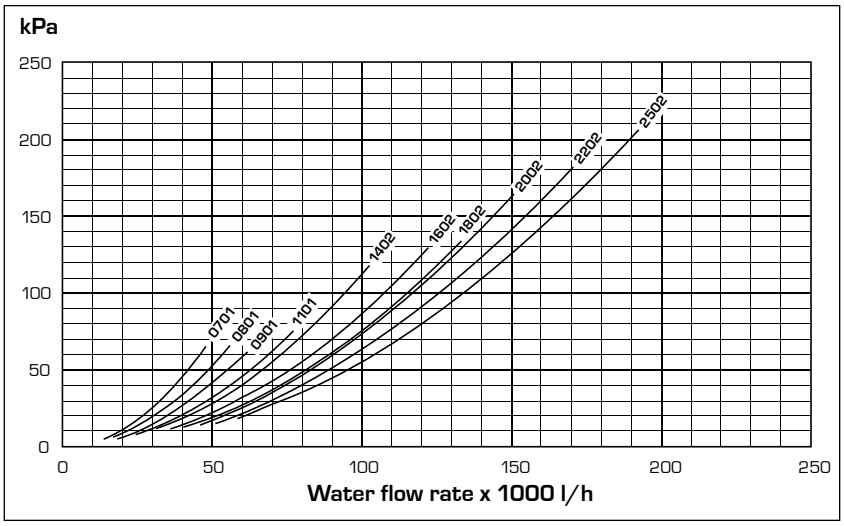
right-hand axis and once the curve is intersected, draw a vertical line which will intercept all the other curves in its turn; the points obtained from the upper curves, represent the coefficients for the cooling capacity and input power , for the flow rates and the pressure drops (remember that these coefficients must anyway be multiplied by the nominal value of the sizes examined); while the lower axis advises the percentage of glycol necessary to produce water at the required temperature.

Remember that the initial sizes "OUTSIDE AIR TEMPERATURE" and "PROCESSED WATER TEMPERATURE", are not directly linked to each other, it will therefore not be possible to enter the curve of one of these sizes and obtain the corresponding point on the other curve.



11. PRESSURE DROP

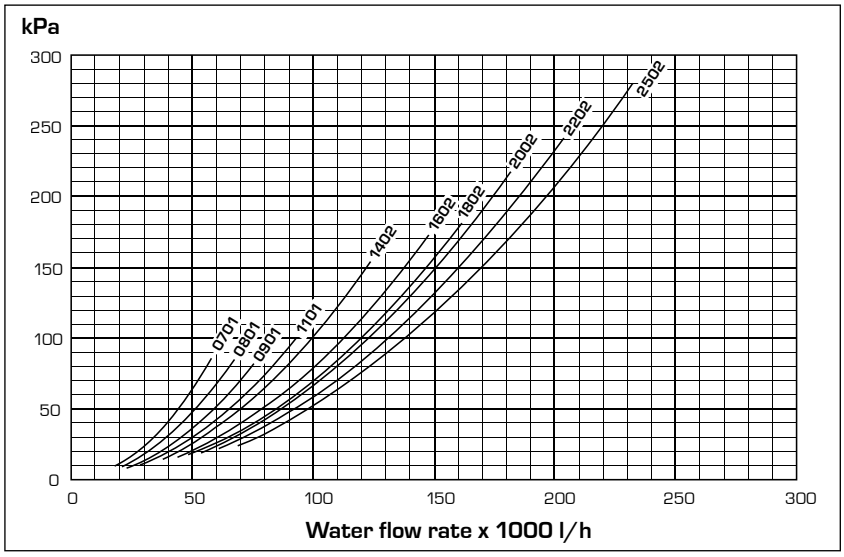
WSH units are supplied WITHOUT the hydraulic parallel; therefore, the pressure drop tables included herein refer to evaporators and condensers.



11.1. EVAPORATOR PRESSURE DROPS IN COOLING OPERATION

The pressure drops in the diagram refer to the average water temperature of 10 °C: the following table shows the correction to be applied to the pressure drops when the average water temperature varies.

Average water temperature °C	5	10	15	20	30	40	50
Multiplicational coefficient	1.02	1	0.985	0.97	0.95	0.93	0.91



11.2. CONDENSER PRESSURE DROPS IN COOLING OPERATION

The pressure drops in the diagram refer to the average water temperature of 30 °C: the following table shows the correction to be applied to the pressure drops when the average water temperature varies.

Average water temperature °C	5	10	15	20	30	40	50
Multiplicational coefficient	1.07	1.05	1.04	1.02	1	0.98	0.96

12. SOUND DATA

12.1. SOUND POWER

Aermec determines the value of the acoustic power on the basis of measurements taken in accordance with the ISO 9614-2 standard in compliance with what is required by the Eurovent certification.

12.2. SOUND PRESSURE

Sound pressure in the open on reflective plane (directional factor Q=2), 10 m away from the unit external surface, in accordance with ISO 3744 (box-method)

KEY
Operating conditions:
Evaporator outlet water 7 °C
Condenser inlet water 30 °C

NOTE
The data of the versions are calculated in cooling mode.

(°)	Total sound levels			Octave band [Hz]						
	Pow.	Pressure.		125	250	500	1000	2000	4000	8000
	dB(A)	dB(A) 10m	dB 1 m	Acoustic power by central band frequency [dB]						
0701	86	54	70	67.2	81.9	81.2	82.9	78.2	71.7	62
0801	86	54	70	66.9	80.8	82.7	83.5	76.9	70.2	61.4
0901	86	54	70	76.1	81.4	82.2	83.1	78.9	68	57.3
1101	92	60	76	62.9	82.3	91.3	88.6	80.1	67.5	56.6
1402	89	57	73	70.2	84.9	84.2	85.9	81.2	74.7	65
1602	89	57	73	69.9	83.8	85.7	86.5	79.9	73.2	64.4
1802	89	57	73	79.1	84.4	85.2	86.1	81.9	71	60.3
2002	93	61	77	76.3	84.8	91.7	89.7	82.5	70.8	59.9
2202	95	63	79	65.9	85.3	94.3	91.6	83.1	70.5	59.6
2502	95	63	79	69.6	86.2	90.1	93.6	85.6	72.2	60.8

(L)	Total sound levels			Octave band [Hz]						
	Pow.	Pressure.		125	250	500	1000	2000	4000	8000
	dB(A)	dB(A) 10m	dB 1 m	Acoustic power by central band frequency [dB]						
0701	78	46	62	63.0	81.3	73.5	74.0	66.7	57.5	49.1
0801	78	46	62	63.4	80.1	74.9	74.8	65.4	56.3	48.5
0901	78	46	62	72.8	80.4	74.4	74.6	67.1	53.8	44.4
1101	84	52	68	58.6	81.6	83.4	80.4	68.3	53.6	43.7
1402	81	49	65	66.0	84.3	76.6	76.9	69.7	60.5	52.1
1602	81	49	65	66.4	83.0	77.9	77.8	68.9	59.2	51.5
1802	81	49	65	75.8	83.4	77.3	77.6	70.1	56.8	47.4
2002	85	53	69	56.9	75.4	80.6	81.4	71.8	57.7	45.9
2202	87	55	71	61.6	84.6	86.4	83.4	71.3	56.6	46.7
2502	87	55	71	66.7	85.7	82.1	85.6	73.9	58.2	47.9

*	Total sound levels			Octave band [Hz]						
	Pow.	Pressure.		125	250	500	1000	2000	4000	8000
	dB(A)	dB(A) 10m	dB 1 m	Acoustic power by central band frequency [dB]						
0701	72	40	56	69.5	69.9	67.9	69.8	62.7	56.2	47.9
0801	74	42	58	67.4	69.9	69.5	71.6	61.4	54.7	47.3
0901	73	41	57	76.2	70.8	68.9	70.4	63.1	52.5	42.9
1101	78	46	62	65.1	70.2	78.3	74.9	64.1	51.8	42
1402	75	43	59	72.5	72.9	70.9	72.8	65.7	59.2	50.9
1602	77	45	61	70.4	72.9	72.5	74.6	64.4	57.7	50.3
1802	76	44	60	79.2	73.8	71.9	73.4	66.1	55.5	45.9
2002	79	47	63	76.5	73.5	78.7	76.1	66.6	55.2	45.4
2202	81	49	65	68.1	73.2	81.3	77.9	67.1	54.8	45
2502	82	50	66	71	74.1	76.6	80.4	69.8	56.5	46.3

* With AKW accessory

13. CONTROL AND SAFETY PARAMETERS SETTING

CHECK PARAMETERS

		min.	standard	max.
Cooling set point	°C	4	7	16
Heating set point	°C	35	48	50
Antifreeze intervention	°C	-9	3	4
Total differential	°C	3	5	10
Autostart		auto		

13.1. COMPRESSOR MAGNETO-THERMAL SWITCH 400V

	0701	0801	0901	1101	1402	1602	1802	2002	2202	2502
MTC1	231A	231A	310A	200A	124A	144A	162A	162A	182A	215A
MTC1A					124A	144A	162A	182A	182A	215A

13.2. COMPRESSOR THERMAL CUT-OUT

	0701	0801	0901	1101	1402	1602	1802	2002	2202	2502
RT	134A	162A	180A	106A	72A	84A	94A	94A	106A	125A
RT1					72A	84A	94A	106A	106A	125A

13.3. COMPRESSOR FUSES NOTE

400 V delayed type

	0701	0801	0901	1101	1402	1602	1802	2002	2202	2502
FU 1	250A	315A	315A	200A	160A	160A	200A	200A	200A	250A
FU 2					160A	160A	200A	200A	200A	250A

13.4. DOUBLE HIGH PRESSURE SWITCH

	0701	0801	0901	1101	1402	1602	1802	2002	2202	2502
PA (bar)	18/19	18/19	18/19	18/19	18/19	18/19	18/19	18/19	18/19	18/19

13.5. HIGH PRESSURE TRANSDUCER

	0701	0801	0901	1101	1402	1602	1802	2002	2202	2502
TA (bar)	17,7	17,7	17,7	17,7	17,7	17,7	17,7	17,5	17,7	17,7

13.6. LOW PRESSURE TRANSDUCER

	0701	0801	0901	1101	1402	1602	1802	2002	2202	2502
TA (bar)	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6

13.7. REFRIGERATOR CIRCUIT SAFETY VALVES

	0701	0801	0901	1101	1402	1602	1802	2002	2202	2502
BP (bar)	16,5	16,5	16,5	16,5	16,5	16,5	16,5	16,5	16,5	16,5
BA (bar)	22	22	22	22	22	22	22	22	22	22

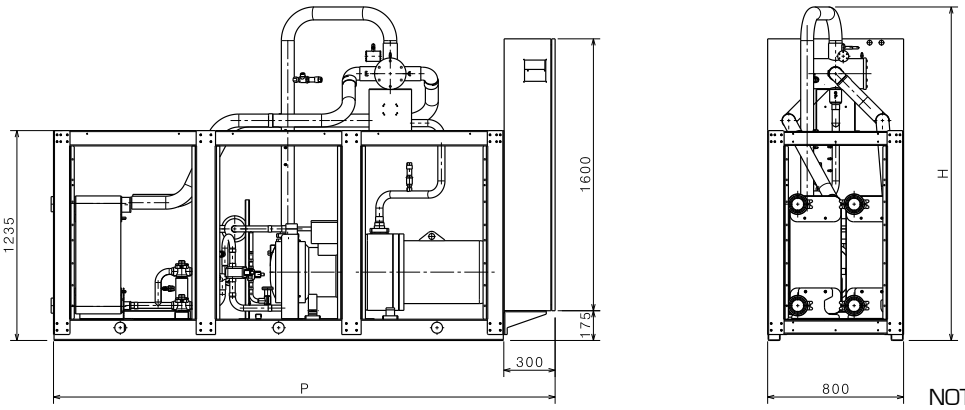
14. DIMENSIONS

As it can be seen from the technical data tables, the dimensions for the different sizes vary only in terms of depth (P), while height (H) and width (L) are the same for all sizes.

NOTE
- The figure below shows only one table, by way of illustration; for the actual dimensions and for the number of fans refer to the table.
- For the position of: "hydraulic connections (in the different set-ups)"

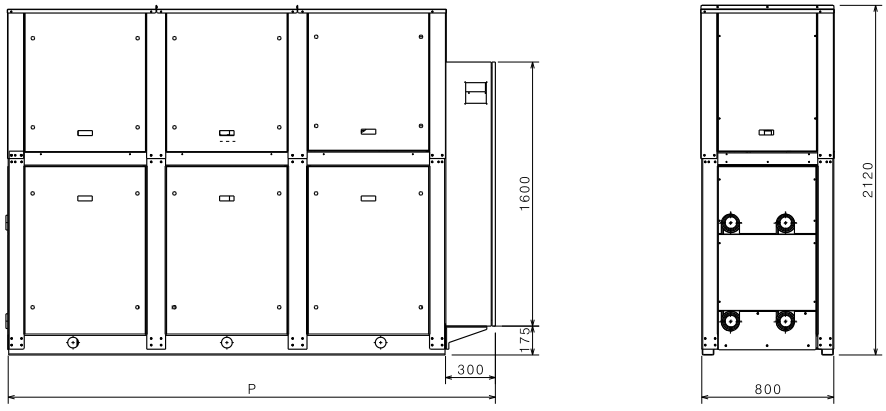
14.1. DIMENSIONAL TABLES

14.1.1. WSH standard version mono circuit (°)



NOTE:
Only the single-circuit versions (0701 - 0801 - 0901 - 1101) are fitted with a base for movement purposes.
The two-circuit versions are moved by means of poles (supplied as standard).

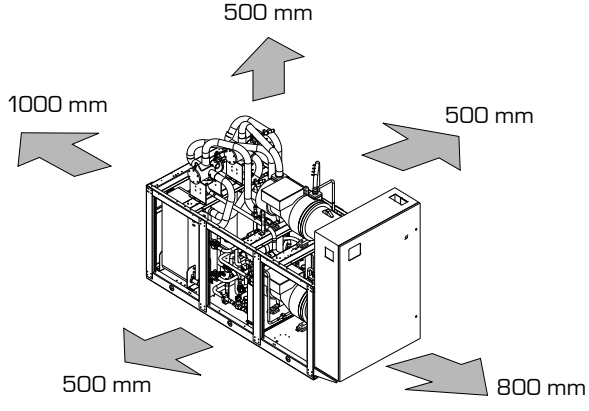
14.1.2. WSH Low noise version mono circuit (L)



WSH	Dimensions in (mm)			
	L	H *	P	kg
0701	809	2120	2960	1391
0801	809	2120	2960	1443
0901	809	2120	2960	1506
1101	809	2120	3360	1946
1402	1249	2120	3060	2276
1602	1249	2120	3060	2350
1802	1249	2120	3060	2423
2002	1249	2120	3460	2872
2202	1249	2120	3460	3309
2502	1249	2120	3460	3407

*The height refers to the low noise version (L)

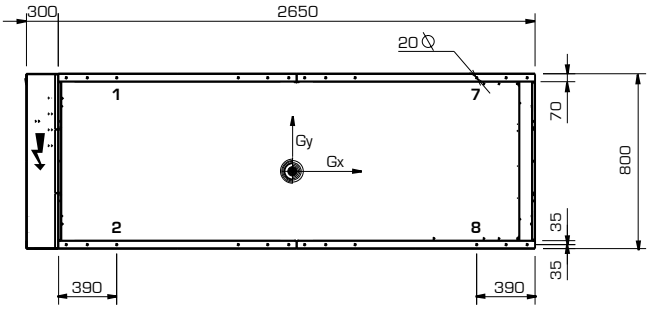
- **Minimum technical spaces**



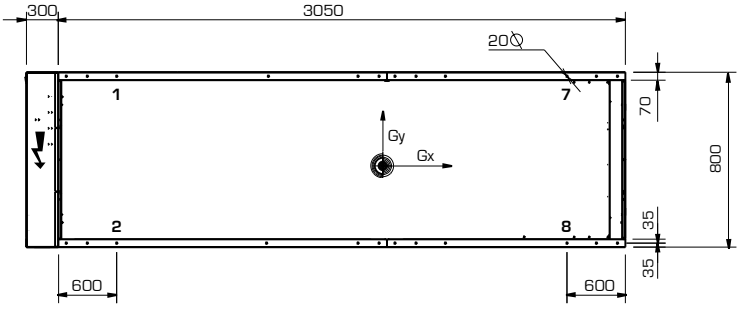
15. WEIGHTS AND CENTRE OF MASS

NOTE:
This chapter shows just the per-centages of weight on the supports (naturally the percentage of weight also identifies the presence of AVX), but refer to the installation manual for its actual position.

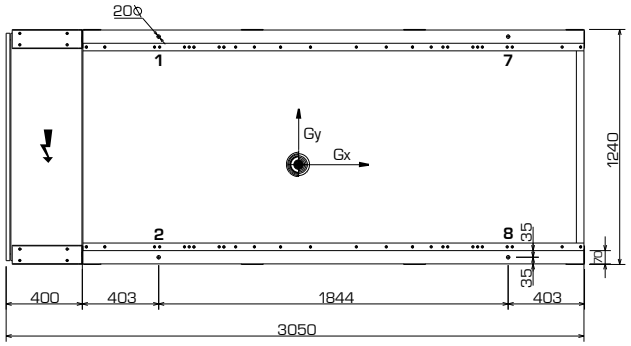
WSH "0701 - 0801 - 0901"



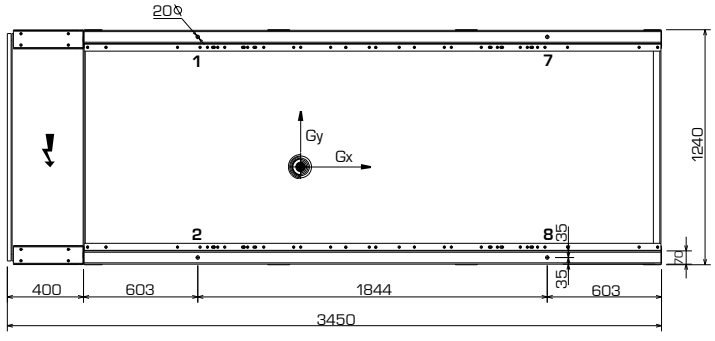
WSH "1101"



WSH "1402 - 1602 - 1802"



WSH "2002 - 2202 - 2502"



15.1. PERCENTAGE DISTRIBUTION OF WEIGHTS ON SUPPORTS

WSH	MOD.	VERS.	WEIGHT	CENTRE OF MASS		PERCENTAGE DISTRIBUTION OF WEIGHTS ON SUPPORTS				AVX
				Gx	Gy	1	2	7	8	KIT
0701	°		1391	1044	400	30%	30%	20 %	20 %	**665**
0801	°		1443	1087	400	30%	30%	20 %	20 %	**665**
0901	°		1506	1127	400	29%	29%	21%	21%	**665**
1101	°		1946	1255	400	31%	31%	19%	19%	**666**
1402	°		2276	1079	620	30%	30%	20 %	20 %	**662**
1602	°		2350	1105	620	30%	30%	20 %	20 %	**662**
1802	°		2423	1129	620	29%	29%	21%	21%	**662**
2002	°		2872	1273	620	30%	30%	20 %	20 %	**663**
2202	°		3309	1253	620	31%	31%	19%	19%	**664**
2502	°		3407	1299	620	30%	30%	20 %	20 %	**664**
0701	°	**L**	1622	1044	400	30%	30%	20 %	20 %	**665**
0801	°	**L**	1674	1087	400	30%	30%	20 %	20 %	**665**
0901	°	**L**	1737	1127	400	29%	29%	21%	21%	**665**
1101	°	**L**	2206	1255	400	31%	31%	19%	19%	**666**
1402	°	**L**	2542	1079	620	30%	30%	20 %	20 %	**662**
1602	°	**L**	2616	1105	620	30%	30%	20 %	20 %	**662**
1802	°	**L**	2689	1129	620	29%	29%	21%	21%	**662**
2002	°	**L**	3168	1273	620	30%	30%	20 %	20 %	**663**
2202	°	**L**	3605	1253	620	31%	31%	19%	19%	**664**
2502	°	**L**	3703	1299	620	30%	30%	20 %	20 %	**664**
0701	°	**D**	1408	1026	400	30%	30%	20 %	20 %	**665**
0801	°	**D**	1462	1069	400	29%	29%	21%	21%	**665**
0901	°	**D**	1525	1108	400	28%	28%	22%	22%	**665**
1101	°	**D**	1968	1237	400	30%	30%	20 %	20 %	**666**
1402	°	**D**	2310	1058	620	29%	29%	21%	21%	**662**
1602	°	**D**	2400	1084	620	29%	29%	21%	21%	**662**
1802	°	**D**	2462	1106	620	28%	28%	22%	22%	**662**
2002	°	**D**	2913	1251	620	30%	30%	20 %	20 %	**663**
2202	°	**D**	3354	1233	620	30%	30%	20 %	20 %	**664**
2502	°	**D**	3458	1276	620	29%	29%	21%	21%	**664**

KEY

° Standard

D With desuperheater

16. HANDLING

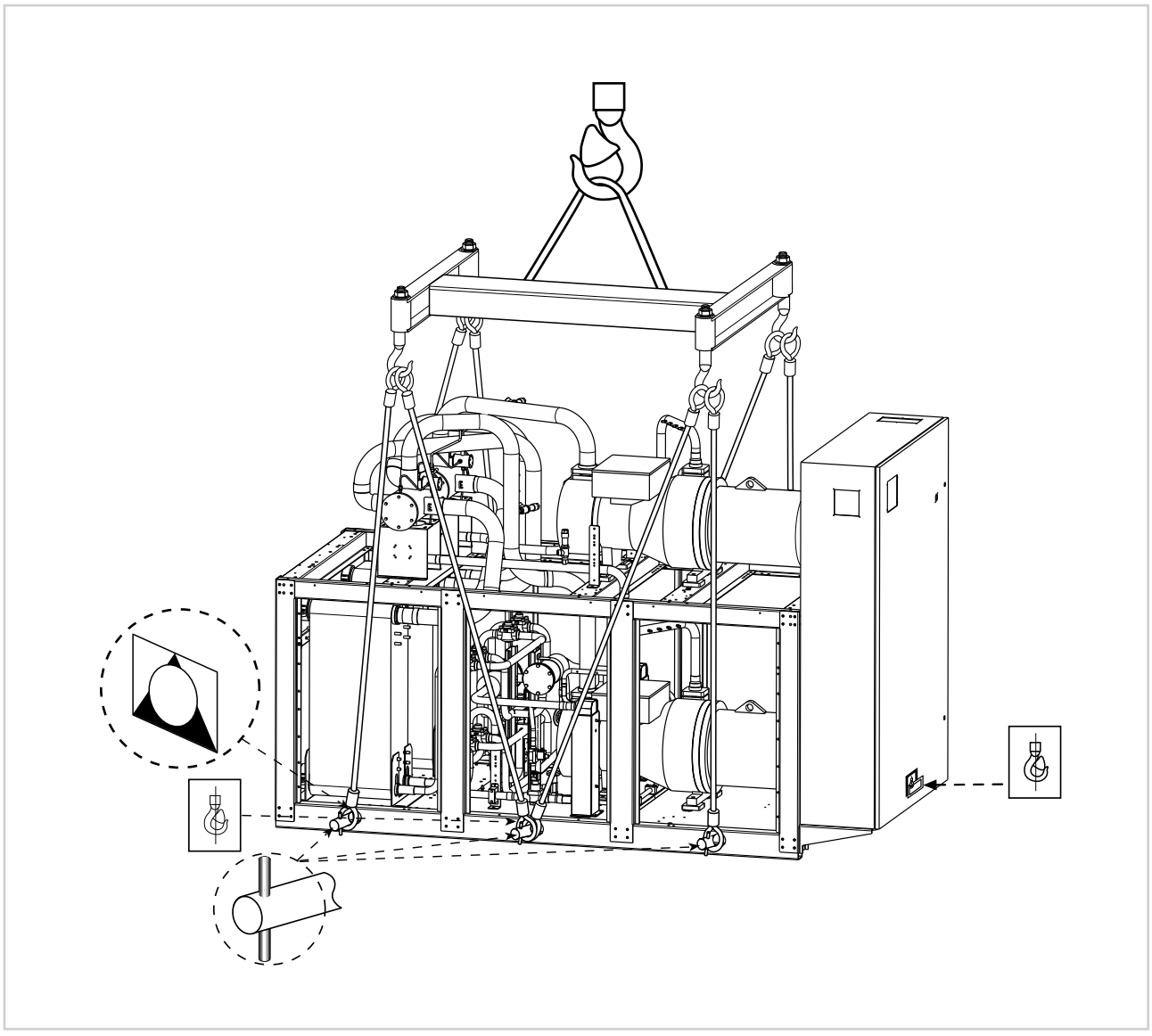
16.1. INSTRUCTIONS FOR LIFTING

- Before moving the unit make sure that all the panels are solidly fixed.
- Use all and only the lifting points indicated.

NOTE
The lifting forks are not supplied.

- Use ropes of equal lengths and suitable for lifting the weight of the unit.
- Move the unit with caution, without jerky movements and do not remain under the unit.
- Movement must be performed by qualified people with the relative means in compliance with safety standards.

16.1.1. HANDLING EXAMPLE



17. SAFETY WARNINGS AND REGULATIONS OF INSTALLATION

17.1. SAFETY WARNINGS

The WSH chiller must be installed by an authorised and qualified technician, in compliance with the national legislation in force in the country of destination.
We shall not be held responsible for any damage whatsoever resulting from the non-compliance with these instructions.

BEFORE STARTING ANY KIND OF WORK, IT IS NECESSARY to read carefully the instructions, and to perform the safety checks to reduce any risk to a minimum. All the personnel in charge must know the operations and possible risks that may arise when all the unit installation operations begin.

DANGER!
The refrigerant circuit is under steam. High temperatures are also possible. The unit may only be opened by a SAT service technician or by an authorised and qualified technician.
The operations in the cooling circuit can only be performed by a qualified refrigeration technician.

GAS R134a
The chiller is delivered with the necessary amount of refrigerant R134a for its operation. It is a refrigerant without chlorine that is not harmful for the ozone layer. R134a is not flammable. However, all the maintenance operations must only be carried out by a specialised technician with the suitable protection equipment
Risk of electric discharge!

Before opening the chiller, it is necessary to disconnect the unit completely from the mains.

17.2. SELECTION OF THE INSTALLATION LOCATION

Before installing the unit, decide with the customer the position in which it will be placed, pay attention to the following points:

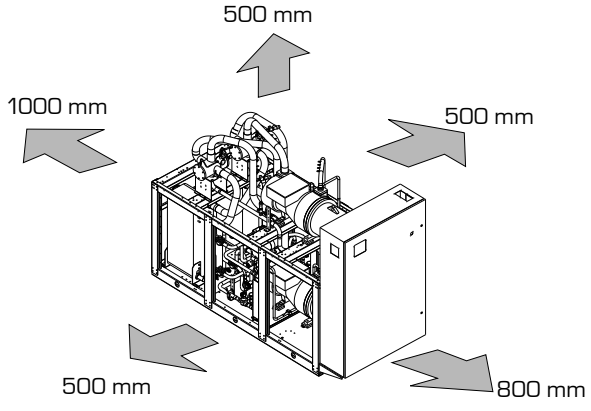
- The support surface must be able to withstand the weight of the unit.
- The selected place must be large enough for laying the necessary pipes.
- Take into account that when the chiller is working, vibrations may be generated; it is therefore advisable to install vibration damper supports (AVX accessories), fitting them to the holes in the base according to the assembly diagram.
- It is compulsory to ensure the minimum technical spaces (Tab.17.2.2), which are essential for the efficient performance OF ROUTINE AND EXTRAORDINARY MAINTENANCE OPERATIONS.

17.3. POSITIONING

- The chiller is dispatched from the factory wrapped in a polyethylene stretchable film, on a pallet.
- Before moving the unit, check the lifting capacity of the machines used.
- Once the packaging has been removed, the unit must be handled by qualified personnel with the suitable equipment.
  To handle the machine:
  "IN CASE OF LIFTING"
  Insert, in the holes in the base, tubes (NOT SUPPLIED), which must be long enough to be able to position the lifting cables.
  In order to avoid damaging the WSH structure with the cables, insert protections between them and the machine.
- Under no circumstance must anybody or anything stop under the unit even briefly.

NOTE:
The warranty of the device does not in any case cover costs incurred as a result of motorised ladders, scaffolding or any other lifting systems made necessary to carry out the operations under warranty.

17.2.2 Minimum technical spaces



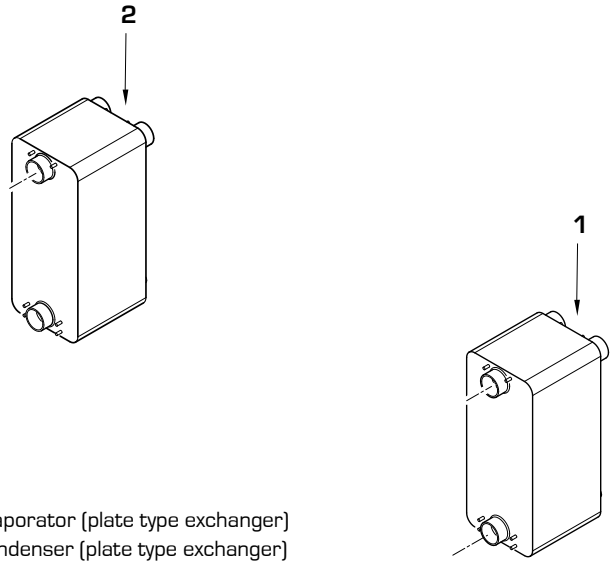
18. HYDRAULIC CIRCUIT

18.1. WSH INTERNAL HYDRAULIC CIRCUIT

The unit is supplied in different versions:

– "**Standard WSH** (only evaporator, condenser without hydronic kit)" (fig. 18.1.1)
  - Plate type exchangers
  - Water inlet and outlet sensors (SIW - SUW).
  - Victaulic connections

18.1.1 Standard WSH (VERSIONS without HYDRONIC KIT)



KEY
1. Evaporator (plate type exchanger)
2. Condenser (plate type exchanger)

18.2. WSH EXTERNAL HYDRAULIC CIRCUIT (NOT SUPPLIED)

The selection and installation of components outside the WSH should be carried out by the installer, who should work according to the technical code of practice and in compliance with the legislation in force in the country of destination.

Anyway, the following installation is recommended:

- Filter 1 evaporator inlet, 1 condenser inlet
  The presence of the filter should be considered obligatory, and ITS REMOVAL WILL MAKE THE GUARANTEE void. It must be kept clean, so it is necessary to check its clean state after the installation of the unit, and check it regularly.
- Pump
- Inertial accumulation tank
- Charging unit
- Expansion tanks
- Safety valve
- Drain valve
- Flow switch
  -it is obligatory to carry out the calibration of the flow switch on the flow rate values requested by the system: if this is not done, the guarantee will be considered void

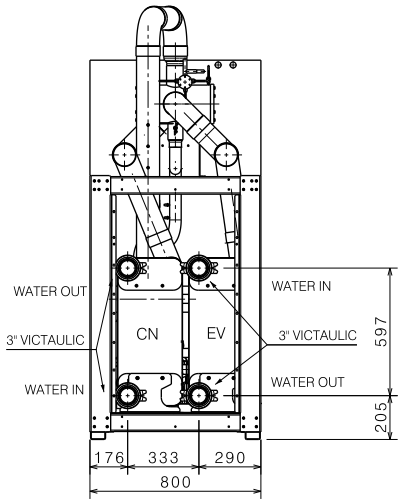
- Manual interception valves
  The installation of the manual interception valves between the unit and the rest of the system should be considered obligatory for all WSH models and for all the hydraulic circuits that concern the chiller itself (desuperheaters): if this is not done, the guarantee will be considered void.

- Flexible high-pressure joints
- Pressure gauge
  The hydraulic piping for connection to the machine must be properly scaled for the actual water flow rate required by the plant when working. The water flow rate to the heat exchanger must always be constant.

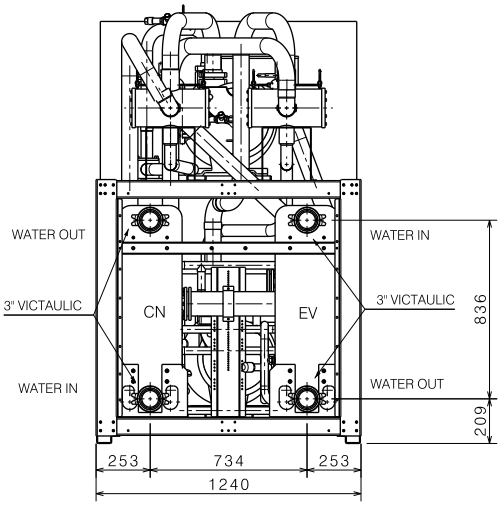
CAUTION
Carefully wash the system, before connecting the heat pump. This is done in order to eliminate possible residues such as welding spatter, waste, rust or any other impurity from the pipes. Otherwise, these materials may remain inside the unit and cause failures. The connection pipes must be properly supported so as not to burden the unit with their weight.

19. POSITION OF HYDRAULIC CONNECTIONS

19.1. STANDARD VERSION (°)



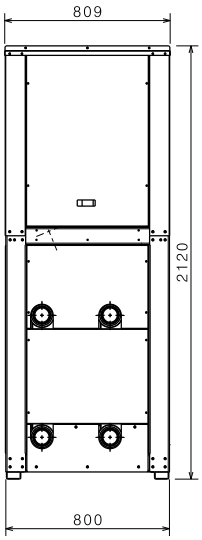
19.1.1. WSH 0701_0801_0901_1101
Standard (°)



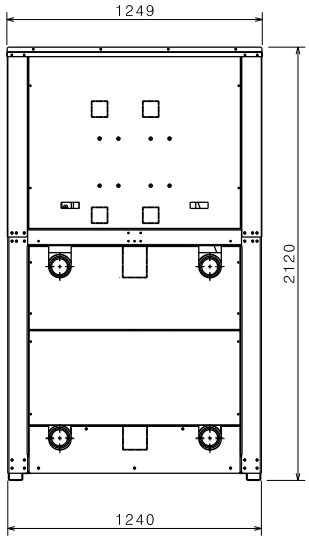
19.1.2. WSH 1402 - 1602 - 1802 - 2002 - 2202 - 2502
Standard (°)

KEY
EV Evaporator
CN Condenser

19.2. QUIET OPERATION VERSION (L)

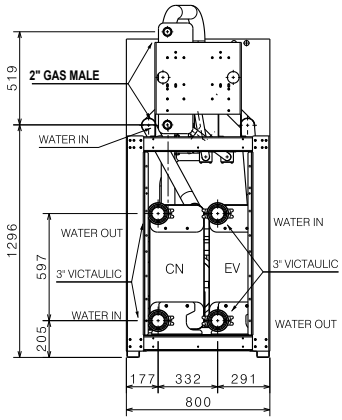


19.2.1. WSH 0701_0801_0901_1101
Low noise (L)

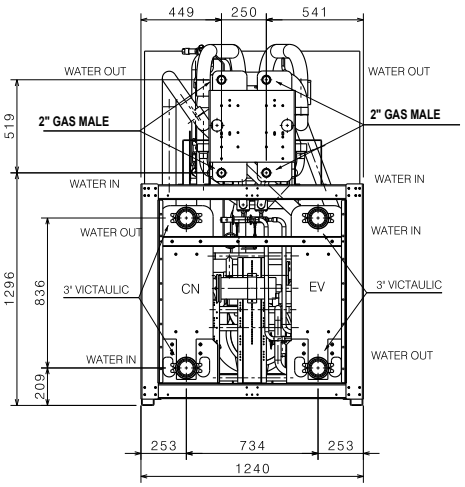


19.2.2. WSH 1402 - 1602 - 1802 - 2002 - 2202 - 2502
Low noise (L)

19.3. DESUPERHEATER VERSION (D)



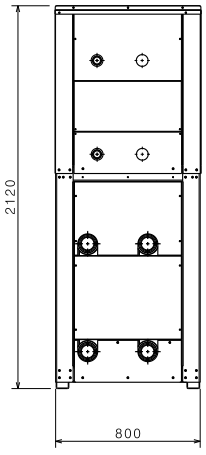
19.3.1. WSH 0701_0801_0901_1101
With desuperheater (D)



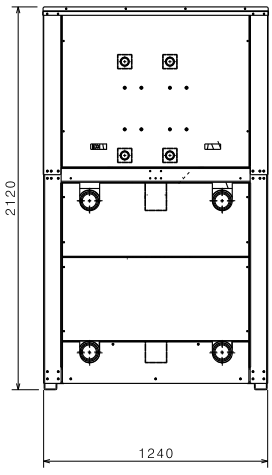
19.3.2. WSH 1402 - 1602 - 1802 - 2002 - 2202 - 2502
With desuperheater (D)

KEY
EV Evaporator
CN Condenser

19.4. LOW NOISE WITH DESUPERHEATER VERSION (DL)



19.4.1. WSH 0701_0801_0901_1101
Low noise with desuperheater (DL)



19.4.2. WSH 1402 - 1602 - 1802 - 2002 - 2202 - 2502
Low noise with desuperheater (DL)

20. ELECTRICAL CONNECTIONS

All the electrical operations must be carried out BY QUALIFIED PERSONNEL, IN ACCORDANCE WITH THE CORRESPONDING REGULATIONS, trained and informed about the risks related to such operations.

The characteristics of electric lines and related components must be established by PERSONNEL AUTHORISED TO DESIGN ELECTRIC INSTALLATIONS, following international regulations and the national regulations of the country in which the unit is installed in compliance with the legislative regulations in force at the moment of installation.

For installation requirements, the wiring layout supplied with the unit must be compulsory referred to. The wiring layout together with the manuals must be kept in good conditions and readily ACCESSIBLE FOR FUTURE OPERATIONS ON THE UNIT.

It is compulsory to check the machine sealing before connecting the electrical wiring. The machine should only be powered once the hydraulic and electric operations are completed.

The unit is fully wired in the factory and, for the start-up, requires a power supply as shown in the indications on the unit's rating plate, with online protective cut-outs.
The cable cross sections and the dimensioning of the line main switch are purely indicative.
The installer will be responsible for properly scaling the power line with regards to the length and type of cable, the input power of the unit and the physical positioning.

All the electrical wiring must comply with the regulations in force at the time of the installation.
The data given in this documentation must only be used as an aid for setting up the electric lines. For installation requirements, the wiring layout supplied with the unit must be compulsory referred to.

Note:
Check that all power cables are correctly secured to the terminals when switched on for the first time and after 30 days of use. Afterwards, check the connection of the power cables every six months.
Slack terminals could cause the cables and components to overheat.
Cross section recommended for the maximum length of 50m. The cross section of the cable and the dimensions of the line main switch are purely indicative.

20.1. ELECTRICAL DATA

WSH	Number power supplies	Versions	SECT. A	Sect. B	Earth	IL
			mm^2	mm^2	mm^2	A
			(no. conductors - sect.) for each phase			
0701	**1**	recovery hole	70	1.5	35	200
0801	**1**	recovery hole	70	1.5	35	200
0901	**1**	recovery hole	95	1.5	50	200
1101	**1**	recovery hole	120	1.5	70	250
1402	**1**	recovery hole	185	1.5	95	315
1602	**1**	recovery hole	240	1.5	120	400
1802	**1**	recovery hole	240	1.5	120	630
2002	**1**	recovery hole	2x150	1.5	150	630
2202	**1**	recovery hole	2x150	1.5	185	630
2502	**1**	recovery hole	2x185	1.5	185	630
2802	**1**	recovery hole	2x185	1.5	185	630

KEY
Sect. A Power supply
Earth Earth to bring to the machine
IL Main switch

21. PUTTING INTO SERVICE

21.1. PREPARATION FOR COMMISSIONING

CAUTION
Keep in mind that commissioning by AERMEC after sales service is free of charge on request from Aermec clients or legitimate owners (VALID IN ITALY ONLY). Placing machines in operation must be previously agreed on the basis of the system creation times. All operations (electrical and hydraulic connections, filling and bleeding of the air from the system), must be completed before the intervention of the AERMEC assistance service.

Before performing the checks indicated below, make sure that the unit is disconnected from the mains, using the suitable instruments.

21.1.1. Electrical checks of the unit disconnected from the power supply

- Check that the general power supply cables are of a suitable section, able to withstand the overall consumption of the unit, and that the unit has been duly earthed.
- Check all the electrical connections are correctly fixed and all the terminals adequately closed.

21.1.2. Electrical checks of the unit connected to the power supply

The following operations must be carried out when the unit is powered up.

- Use a tester to check that the supply voltage value is 230V ±10% or 400V ±10%, depending on the version.
- Check that the wiring connected by the installer comply with the wiring layouts on board the machine.
- Power up the unit by turning ON the main switch. The display will light up some seconds after the unit is powered up, check that the operation status is OFF.

21.1.3. Hydraulic circuit controls

- Check that the system has been washed and that the cleaning water has been discharged before the unit is connected to the system
- Check that all the hydraulic connections are correctly made and that the indications on the plates are observed.
- Check that the hydraulic system is full and under pressure, and also make sure that there is no air (if there is air, bleed it).
- Check that any interception valves on the system are correctly opened.

21.2. COMMISSIONING

NOTE
For the setting of all functional parameters and for detailed information regarding machine functioning and the control card, refer to the user's manual.

After carefully carrying out all the checks detailed above, it is possible to start up the unit. Check the set working parameters (set-point) and reset any alarms that may be present. After a few minutes, the unit will start up.

21.2.1. Cooling circuit controls

- Check for refrigerant gas leaks, especially near pressure inlets and pressure switches. (vibration during transport may have loosened the connectors).

- The high pressure switch stops the compressor, generating the related alarm, when the delivery pressure exceeds the set point. To check whether this device works correctly, close the water intake to the condenser and, observing the pressure gauge, which may have been installed by the user or installer because it is not supplied by the factory in the corresponding high pressure inlets, verify whether the switch is tripped at the calibrated value.

CAUTION
If the switch does not trip at the calibrated value, immediately stop the compressor and identify the cause. The alarm reset is manual and can only enabled once the pressure drops below the differential value.

21.2.2. Overheating

Check the level of overheating by comparing the temperature indicated with a contact thermometer placed on the compressor suction and the temperature shown on the pressure gauge (saturation temperature corresponding to the evaporation pressure).
The difference between these two temperatures gives the superheating value. Optimum values are between 4 and 8°C.
In these units the pressure gauge is not supplied; it is advisable to install it in the corresponding pressure inlet.

21.2.3. Under-cooling

Check the level of under-cooling by comparing the temperature indicated with a contact thermometer placed on the tube at the condenser outlet and the temperature shown on the high pressure gauge (saturation temperature corresponding to the condensation pressure).
The difference between these two temperatures gives the under-cooling value. Optimum values are between 4 and 5°C.
In these units the pressure gauge is not supplied; it is advisable to install it in the corresponding pressure inlet.

21.2.4. Delivery temperature

If the under-cooling and superheating values are correct, the temperature measured in the delivery tube at the compressor outlet must be 30/40°C above the condensation temperature.

21.3. SYSTEM DISCHARGE

It is advisable to drain the system only when the unit is going to remain inactive for extended periods, or for maintenance operations that require draining.

- Before starting to drain the system, turn "OFF" the main switch:
- Check that the water filling/topping up tap is closed (NOT SUPPLIED).
- Open the drain tap and all the drain valves of the system and the corresponding terminals.

CAUTION
If the system uses glycol, this liquid should not be drained freely because it is polluting. It must be collected and, if possible, reused.

- Use of exchanger heaters.
  In this case the heaters must always be powered for the entire winter period (machine in standby).
  Circuit with glycol
- The operation with glycol water, with a glycol percentage chosen on the basis of the minimum outside temperature envisaged. In this case due account must be taken of the different yields and input requirements of the chiller, the scaling of the pumps and terminal yields.

22. MAINTENANCE

Note
All the routine and extraordinary maintenance operations must be carried out only by qualified personnel. Before starting any cleaning or maintenance operation, it is advisable to disconnect the unit from the power supply.

22.1. MAINTENANCE WARNINGS

Inspection, maintenance and possible repair operations must be carried out only by an authorised technician according to the law.
A deficient check/maintenance operation may result in damage to things and people.

Maintenance operations constitute a necessary condition for the unit safe and long-lasting operation, high reliability and long life.
All the units are subject to wear along time.
Maintenance operations allow:
- To keep the unit efficiency
- To reduce the speed of wear
- To collect information and data and understand the unit efficiency status to prevent possible failures.

It is therefore essential to carry out, once a year, checks such as:

22.1.1. Hydraulic circuit
- Water circuit filling
- Clean the water filters
- Check the flow switch, if fitted
- Eliminate the air from the circuit
- Check that the water flow rate is always constant.
- Check the hydraulic piping thermal insulation state
- Check the glycol percentage, when present.

22.1.2. Electric circuit
- Efficiency of safety devices
- Electrical power supply
- Electrical power consumption
- Electrical connections
- Check the conditions of electrical wires and their insulators
- Check the compressor casing operation.

22.1.3. Chiller circuit
- Compressor conditions
- Efficiency of the plate type exchanger heater
- Check the working pressure
- Efficiency of the compressor/s heater
- Check the cooling circuit sealing, and make sure that the pipes in it have not suffered damages.
- Check the high pressure switch operation, in case of failure, replace the switches
- Check the filter-drier fouling state. If there is scale in it, replace it.

22.1.4. Mechanical controls
- Check that screws, compressors and the electronic box of the unit external panelling are properly tightened. If they are poorly tightened, they produce abnormal noise and vibrations
- Check the structure conditions.
  If necessary, treat oxidised parts with paints suitable for eliminating or reducing oxidation.

It is advisable to keep a machine booklet (not supplied, but provided by the user), in order to keep trace of the operations carried out on the unit. In this way, it will be easier to organise the operations properly and facilitate failure prevention and troubleshooting in the machine.
In the booklet, write down date, type of operation carried out (routine maintenance, inspection or repair), description of the operation, measures taken...

22.2. EXTRAORDINARY MAINTENANCE

WSH chillers are charged with gas R134a and tested in the factory. In normal conditions, no Technical Assistance Service operation is needed for the refrigerant gas check. Except for version E, which is sold only with the charging capacity. Along time, however, small leaks from the joints may be generated. Due to these leaks, the refrigerant comes out and the circuit is drained, causing the unit malfunction. In these cases, the refrigerant leakage points are found and repaired, and the cooling circuit is recharged, operating in compliance with Law 28 December 1993 no. 549.

CAUTION
It is forbidden to CHARGE the cooling circuits with a refrigerant different from the one indicated. If a different refrigerant gas is used, the compressor may result seriously damaged.

23. DISPOSAL

23.1. DISCONNECTING THE UNIT

The unit disconnection operations must be carried out by a registered technician.

Before disconnecting the unit, the following elements must be removed, if present:

- The refrigerant gas: the gas must be removed with suction devices that operate in closed circuit so that there is no gas leak in the environment.
- The glycol must not be thrown away in such a manner that affects the environment when it is removed. It must be placed in suitable containers.

Note

The disposal of refrigerant gas, the glycol water that may be present and any other material or substance must be carried out by qualified personnel and in compliance with the legislation in force, in order to avoid causing damages to things or people as well as polluting the surrounding area.

When the unit is pending disposal, it can also be stored in the open, as exposure to the elements and temperature changes do not cause harmful effects for the environment, as long as the unit electrical, cooling and hydraulic circuits are closed and in good conditions.

23.1.1. Dismantling and disposal

In the dismantling phase, the fan, the motor and the coil, if operating, could be taken from the specialised centres for possible reuse.

NOTE

For the dismantling/disposal, all the materials must be sent to the authorised centres in compliance with the national regulations in force. For further information on discharge contact the head office.

24. IMPROPER USES

The device is designed and built to ensure the maximum safety in its immediate vicinity (IP20) as well as to resist atmospheric agents.

24.1. IMPORTANT SAFETY INFORMATION

The machine must not exceed the pressure and temperature limits indicated in the table shown in the Operating limits" section.

Correct functioning is not guaranteed after a fire; before starting up the machine again, contact an authorised Assistance Centre.

The machine is fitted with safety valves that in the case of excessive pressure can discharge hot gases into the atmosphere.

Wind, earthquakes and other natural phenomena of exceptional intensity have not been taken into account.

If the unit is used in an aggressive atmosphere or with aggressive water, consult the company headquarters.

CAUTION

Following extraordinary maintenance interventions on the cooling circuit, with the replacement of components, before restarting the machine it is necessary to carry out the following operations:

- Pay the greatest attention when restoring the refrigerant load indicated on the machine rating plate.
- open all the taps in the cooling circuit
- correctly connect the power supply and the earthing

CHECKS IN THE SYSTEM

- Check the hydraulic connections in the entire system
- Check the water pump is working correctly
- Clean the water filter/s

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